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COSTS AND BREAK EVEN VOLUMES FOR UNIVERSAL DENSITY AND MODIFIED FLAT BALE PRESSES

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ABSTRACT: Breakeven volumes for installation of a universal density press versus a modified flat bale press were developed for 8, 12, 16, 20, and 24 bale per hour gins. The breakeven point ranged from 3,850 bales at 12 bale per hour gins to 5,117 bales at 24 bale per hour gins. An equation, enabling an individual gin owner or manager to substitute his own specific data and calculate breakeven volumes for his ginning operation is presented.

KEYWORDS: Cotton, gins, density, breakeven volumes.

INTRODUCTION

The development and recent acceptance of the Universal density (UD) cotton bale by all segments of the cotton industry have caused many gin operators to consider making substantial changes in their pressing operations. With UD compression of bales at the gin to approximately 28 pounds per cubic foot, no further compression is required in subsequent stages in the marketing system, including bales for export. Traditionally, bales are pressed to a density of about 12 to 14 pounds per cubic foot (modified flat press) at the gin and then further pressed to a higher density at compress facilities.

The modified flat (MF) bale press is essentially a regular flat bale gin press that has been modified by lining the press box with wood to reduce the bale width to accommodate the necessary bale dimension for UD compression later in the marketing system. Any new baling installation should involve either the UD or the MF bale press to accommodate today's marketing needs. A bale of cotton initially compressed to a universal density at the cotton gin offers many potential savings and benefits in handling, compressing, and storage to the cotton industry. UD compression, however, requires a greater capital investment by the gin in addition to other financial considerations. In most areas, an allowance or rebate is paid to the ginner by the cotton warehouse for delivery of UD bales for storage. The amount of this allowance, usually about \$3 per bale, is eventually passed on to the

buyer of the cotton as a compression charge when the bale is removed from storage and shipped.

Gin operators, when considering installation of a UD press in a new gin instead of a new MF bale press or replacing an older flat bale press in an existing plant, must compare the additional costs of owning the UD press with the potential savings in operation and the additional revenue (rebates) resulting from its installation and use. This article describes the cost relationships and computational procedures necessary to enable gin operators to make these economic determinations regarding their operation.¹

DETERMINING THE TYPE OF PRESS TO INSTALL IN NEW GINS

In considering the installation of either a UD press or a MF bale press, there is an annual volume of bales pressed short of which installation of the MF press is advisable and beyond which the added investment for a UD press is justified. This point is the volume at which the total compression costs using either type of press is the same. This indifference point, or breakeven volume,

¹ This article is based on results of a comprehensive study of baling cotton at gins. The complete analysis is currently being cleared for publication by the Economic Research Service.

for a given size gin can be determined by using the following equation and cost relationships:

$$\begin{aligned} & \text{Pct} (I_{UD} - I_{MF}) + (P_{UD} - P_{MF}) (X) + (Rv_{UD} - Rv_{MF}) \\ & (X) + (Rf_{UD} - Rf_{MF}) + \frac{\text{Br} (C_{UD} - C_{MF}) (Wr) (X) +}{\text{Wh} (C_{UD} - C_{MF}) (Wr) + (Bt_{UD} - Bt_{MF}) (X) - A_{UD}} \\ & (X) = 0 \end{aligned}$$

Where UD = universal density bale press.

MF = modified flat bale press.

X = breakeven volume.

Pct = combined percentage rate (13.5 percent) for calculating annual fixed costs, composed of depreciation (7 percent), taxes (2 percent), insurance (0.5 percent), and interest of 8 percent on half of total investment.

I = investment requirement for each type of bale press (see table 18).

Br = actual average seasonal processing rate in bales per hour—8, 12, 16, 20, and 24 considered in this article.

P = power cost per bale by press type—11 cents for UD presses and 2 cents for MF presses.

Rv = variable repair and supply costs per bale by press type—5 cents for UD presses and 3 cents for MF presses.

Rf = fixed annual repair and supply cost per bale by press type—\$500 for UD presses and \$250 for MF presses.

Ph = percentage of hours press crew paid compared to operating hours at rate "Br" when seed cotton is available—110 percent for both press types.

C = press crew size by press type (see table 19).

Wr = hourly wage rate for press crew—\$3.40 including fringe expenses.

Wh = annual hours press crew is on duty and paid while press is idle—estimated at 250 hours per season for both press types and all processing rates.

Table 19—Average press crew requirements by press type and processing rate

Ginning and baling rate	Press crew requirements	
	Universal density	Modified flat
Bales per hour	Number of employees ¹	
8	1½	3
12	2	4
16	2½	4½
20	3	5
24	3	5

¹ Fractional number of employees assumes assignment to other tasks not allocated to pressing operation.

Based on actual observations at gins equipped with universal density presses using automatic strapping on naked bales with a conveyor sacking system, and at conventional modified flat presses using manual strapping and jute bagging.

Bt = bagging and tie cost per bale by press type—\$3.75 per UD and \$4.75 per MF bale.

A_{UD} = per bale allowance for gin UD bale paid to ginner by warehouse or compress—0 to \$3.00 per UD bale.

For example, using these values and rates taken from actual ginning records, the breakeven volume between new presses of the two types for a 16 bale per hour gin can be calculated as follows:

$$\begin{aligned} 1. & -0.135 (\$265,000 - \$95,000) + (\$0.11 - \$0.02) (X) + \\ & (\$0.05 - \$0.03) (X) + (\$500 - \$250) + \\ & 1.1 (2.5 - 4.5) (\$3.40) (X) + 250 (2.5 - 4.5) (\$3.40) + \\ & \quad \quad \quad 16 \\ & (\$3.75 - \$4.75) (X) - \$3.00 (X) = 0 \end{aligned}$$

$$2. -\$22,950 + \$0.09 (X) + \$0.02 (X) + \$250 - \$0.4675 (X) - \$1,700 - \$1.00 (X) - \$3.00 (X) = 0$$

$$\begin{aligned} 3. & -\$21,500 - \$4.3575 (X) = 0 \\ & X = 4,934 \text{ bales (breakeven volume)} \end{aligned}$$

Table 18—Installed costs of universal density and new modified flat bale presses, by size group, 1975

Cost items	Gin size group and press type			
	Up to 15 bales/hour		16-24 bales/hour	
	Universal density ¹	Modified flat ²	Universal density ¹	Modified flat ²
	Dollars	Dollars	Dollars	Dollars
Press, complete including freight	130,000	65,000	160,000	72,000
Automatic strapping equipment ³	34,000	---	42,000	---
Installation—labor and material ⁴	42,000	20,000	44,000	23,000
Conveyor bale packaging system ⁵	19,000	---	19,000	---
Total installed cost	225,000	85,000	265,000	95,000

¹ Current investment costs in late 1975. ² Late 1975 cost quotations for a new modified flat bale press with a 24" X 54" press box. ³ Assumes 1 strapping head for up to 15 bales per hour and 2 strapping heads for 16-24 bales per hour universal density presses; also includes allowance for a spare head, test

stand, and recommended parts inventory. Manual strapping assumed for modified flat bale presses. ⁴ Assumes no major modifications of, or additions to the existing gin building. ⁵ Includes conveyor sacking system to place naked strapped bale into burlap bag, bale scale and conveyor to outside.

The above equation can be used to calculate breakeven volumes under different cost conditions using the appropriate value for a specific situation. For example, breakeven volumes shown in table 20 were developed by

Table 20—Breakeven volumes for new gins at different allowance rates, by gin plant size

Universal density compression allowance	Gin plant size (bales per hour)				
	8	12	16	20	24
<i>Per bale</i>	<i>Bales</i>	<i>Bales</i>	<i>Bales</i>	<i>Bales</i>	<i>Bales</i>
None	11,233	11,531	15,838	17,009	17,891
\$1.00	6,898	6,943	9,120	9,496	9,765
\$1.50	5,782	5,791	7,524	7,779	7,958
\$2.00	4,977	4,967	6,404	6,587	6,715
\$2.50	4,369	4,348	5,574	5,712	5,808
\$3.00	3,893	3,850	4,934	5,042	5,117

Based on average cost and operating relationships of actual cotton gins.

introducing several allowance rates for UD compression and holding all other variables constant. However, changes in crew requirements, wage rates, bagging and tie costs or investment cost can readily be inserted in the equation and a new set of breakeven volumes developed.

REPLACING AN EXISTING MODIFIED FLAT BALE PRESS

A gin owner considering the installation of a new UD press in place of an existing MF bale press which could be used for several more years also needs to know the breakeven or indifference volume for his plant.

Investments in existing MF bale presses vary appreciably from plant to plant. Investment costs used to calculate breakeven volumes for these plants typify those costs commonly incurred in installing a new flat bale press in the early 1960's and modified in 1973. Combined, these costs were \$25,000 for a MF bale press with a capacity of up to 15 bales per hour, and \$30,000 for one with a capacity of 16-24 bales per hour. With other cost relationships and assumptions remaining the same, breakeven volumes between the two types of presses for various UD compression allowances were computed and are shown in table 21.

Based on the current UD compression allowance (\$3.00 per bale), breakeven volumes ranged from 5,657 bales in 8-bale per hour gins to 7,205 bales in the 24-bale per hour gins. Substantial increases in breakeven volumes occur as the compression allowance decreases.

Breakeven volumes when replacing an existing MF bale press that could be used for several more years with

Table 21—Breakeven volumes for replacement of an existing press at different allowance rates, by gin plant size

Universal density compression allowance	Gin plant size (bales per hour)				
	8	12	16	20	24
<i>Per bale</i>	<i>Bales</i>	<i>Bales</i>	<i>Bales</i>	<i>Bales</i>	<i>Bales</i>
None	16,323	16,884	22,302	23,952	25,193
\$1.00	10,024	10,166	12,842	13,372	13,751
\$1.50	8,403	8,479	10,595	10,953	11,206
\$2.00	7,233	7,272	9,017	9,275	9,456
\$2.50	6,349	6,366	7,848	8,043	8,179
\$3.00	5,657	5,636	6,948	7,100	7,205

Based on average cost and operating relationships of actual cotton gins.

a new UD press, are about 45 percent higher for the 8 and 12 bale per hour plants and 41 percent higher for the 16 to 24 bale per hour plants than the volumes required for new MF bale presses compared to new UD presses. Breakeven volumes are higher because the investment and related fixed costs of the existing flat bale press are considerably lower than the costs of a new flat bale press.

IMPLICATIONS

Results show that the installation of UD presses rather than MF bale presses when erecting new gins appears to be justified with projected annual volume of over 3,850 bales in the 8 and 12 bale per hour gins and over 5,000 bales for the 16, 20, and 24 bale per hour plants. However, any significant decrease in the compression allowance results in a significant increase in breakeven levels required. Moreover, when erecting a new facility, a larger size gin than is actually needed should not be constructed just because volume levels would also justify UD compression.

Replacement of an existing MF bale press which could be used several more years with a new UD press appears to be justified in 16, 20, and 24-bale per hour gins with projected annual volumes of over 6,948 bales. These findings further indicate that these volumes are even lower for 8 and 12-bale per hour plants. Based on the capacities and volumes of the U.S. ginning industry, a sizeable expansion in the use of UD presses appears feasible from an economic standpoint. However, costs of new UD presses are likely to be higher in the future than those on which the findings of this study are based. Costs of bagging and ties, labor, power, and other basic inputs are also rising. Changes in the relative cost differences between these two types of presses will also have an impact on breakeven levels.

